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(54) Polymer sheathing material for cables and wires

(57) A flame retardant polymer mixture for the sheathing of cables and wires comprises copolymers of ethylenevinyl acetate and ethylene-butyl acrylate, grafted with organosilane for cross-linking, a cross-linking catalyst, 3 to 15% by weight of ethylene-vinyl acetate containing 50% vinyl acetate, and 21 to 32% by weight of aluminium hydroxide. The presence of the second ethylene-vinyl acetate copolymer enables an increased amount of aluminium hydroxide to be incorporated in the mixture, thereby improving both flame retardancy and flexibility.

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SPECIFICATION

Polymer sheathing material

This invention relates to a polymer mixture for the sheathing of cables and wires and in particular to a silane cross-linkable polymer mixture for the sheathing of electric and/or optical cables and wires, of the kind which contains copolymers of ethylene-vinyl acetate and ethylene-butyl acrylate, organosilane grafted thereon for the cross-linking, a cross-linking catalyst, and a flame-retardant filling material.

Polymer mixtures of the aforementioned type for the sheathing of cables and wires are commercially available. Upon adding the catalyst, they are chiefly processed by way of extrusion in the course of which, owing to the effects of humidity from the ambient atmosphere and on account of the grafted silane, there occurs a silane cross-linking or vulcanizing. As a catalyst there is used, for example, dibutyl-tin dilaurate in the form of a 10-% batch based on ethylene-vinyl acetate (EVA). The silane cross-linking can be accelerated by immersing the extruded product in hot water or by exposing it to water vapour. The cross-linked product shows itself to have an elongation at break of about 130% and an oxygen index of 29%. For some practical applications, the material is not sufficiently flame-retardant, this being indicated by the relatively low oxygen index. With this material it is not possible to increase the flame-retardant properties by adding a further aluminium hydroxide. Moreover, with regard to some practical applications, the material is of insufficient flexibility.

It is an object of the present invention to modify the aforementioned polymer mixture in such a way that the cross-linked product has a substantially improved flame-retardant property as well as a higher flexibility.

According to the invention in its broadest aspect, a polymer mixture of the kind referred to is characterized in that the mixture additionally contains 3 to 15% by weight of the total amount of ethylene-vinyl acetate having a vinyl-acetate content of 50%, as well as 21 to 32% by weight of the total amount of aluminium hydroxide.

By combining the previously known polymer mixture with an ethylene-vinyl acetate copolymer having a vinyl-acetate content of 50% it is achieved that the mixture can take up a considerable amount of aluminium hydroxide, thus considerably improving the flame-retardant properties of the final product. At the same time, the final product has a substantially higher flexibility than the known polymer mixture. In spite of this modification, the mixture can be cross-linked just like the conventional types of silane cross-linkable polymer mixtures. The final product shows itself to have an elongation at break of 150% and thus complies better with the requirements of VDE 0207, Pt.27, than the original mixture. The oxygen index amounts to about 40%, which implies that the flame-retardant properties have been improved considerably. Therefore, even with thin cables, it is possible to comply with the flame test according to VDE 0472, Pt. 804 Method C. In spite of the higher degree of filling, the modified material is considerably more flexible than the previously known silane cross-linked material.

A cross-linkable polymer mixture according to the invention has a composition within the ranges specified below, with ethylene-vinyl acetate being referred to as EVA, and with vinyl-acetate being referred to as VA:

grafted, flame-retardant polymer	53 to 75% by weight
EVA copolymer (50% VA)	3 to 15% by weight
aluminium hydroxide	21 to 32% by weight

The preferred composition consists of the following components:

grafted, flame-retardant polymer + catalyst	146 parts by weight
EVA copolymer (50% VA)	40 parts by weight
aluminium hydroxide	85 parts by weight

The cross-linked insulating compound has the following properties;

tensile strength	approx. 9 N/mm^2
elongation at break	approx. 150%
Shore-A hardness	approx. 88
oxygen index	approx. 40%

The cross-link time for 1mm thick stampings amounts to about three hours in the hot-water bath at 70°C, by adding the usual catalyst of 3% as a batch.

CLAIMS

1. A silane cross-linkable polymer mixture for the sheathing of electric and/or optical cables and wires, of the kind which contains copolymers of ethylene-vinyl acetate and ethylene-butyl acrylate, an organosilane grafted thereon for the cross-linking, a cross-linking catalyst, and a flame-retardant filling material, characterized in that the mixture additionally contains 3 to 15% by weight of the total amount of ethylene-vinyl acetate having a vinyl-acetate content of 50%, as well as 21 to 32% by weight of the total amount of aluminium hydroxide.

2. A polymer mixture as claimed in claim 1, characterized in that the content of organosilane-grafted copolymers of ethylene-vinyl acetate and ethylene-butyl acrylate and the cross-linking catalyst amounts to from 53 to 75% by weight of the total amount.

3. A polymer mixture as claimed in claim 1 or 2, characterized by the following composition: 145 parts by weight of flame-retardant, grafted copolymer of ethylene-vinyl acetate and ethylene-butyl acrylate and catalyst, 40 parts by weight of ethylene-vinyl acetate copolymer with 50% of vinyl acetate, and 85 parts by weight of aluminium hydroxide.

4. A polymer mixture substantially as described with reference to the accompanying drawings.

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